THE MICROSCOPICAL BULLETIN AND SCIENCE NEWS

A BI-MONTHLY MAGAZINE

OCTOBER, 1897

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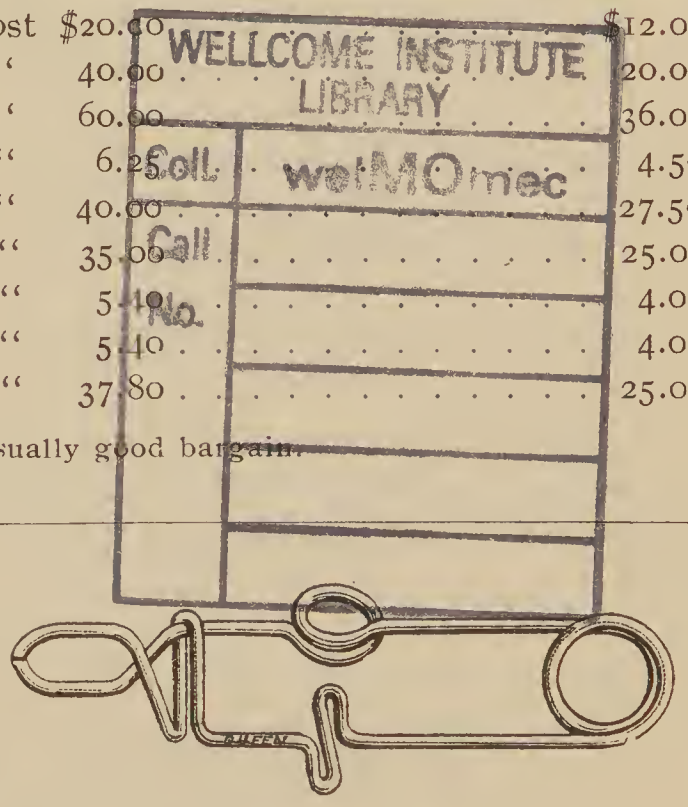

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THE

MICROSCOPICAL BULLETIN

AND

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NOTES AND COMMENTS.

We note with pleasure the appointment of Dr. H. F. Harris as Associate Professor of Bacteriology and Pathology in the Jefferson Medical College, of Philadelphia. Since the establishment of the new laboratories of normal and pathologic histology and bacteriology in the above institution, Dr. Harris has been assistant to Professor W. M. L. Coplin in their direction. With such exceptional facilities at his disposal, Dr. Harris will have an excellent opportunity for both original investigation and the further perfection of laboratory methods as applied to teaching. The BULLETIN wishes him every success.

* * *

Professor Wm. P. Wilson, Director of the Philadelphia Commercial Museums has issued an attractive pamphlet in which is described a new feature of the museum—the Laboratory of Tests and Technology. In this department are made physical, chemical and microscopic tests of the utility and commercial value of foods and materials. Such an addition to the working capacity of the museum is a wise one and will doubtless be welcomed by our merchants and manufacturers.

A photo-micrographic apparatus for the production of greatly enlarged images has been recently described through the daily press. The scheme of magnifying the image formed by one compound microscope by means of another compound system placed "tandem" to it is not a new one and appears on the face of it to be useless. To the optician and microscopist it has long been apparent that further increase in the magnifying power of microscopes must primarily depend upon improvement of high power *objectives* and not upon high power eye-pieces, which the plan used in Washington virtually is. Good definition under such high eye-piecing as is suggested, is only obtained by the use of *low power* objectives. If this low objective is not of sufficient power to properly resolve the detail in the object, the incomplete but enormous image cast by the high power ocular, whether it be a compound microscope or not, is of no value. The original cone of light when distributed over such an area is too weak to allow of perfect definition even though the optical work of whole system be perfect. If this cone be more intense the performance of the first objective is decidedly impaired. In the present state of applied optics the best work or brain cells or any other structure will be done with the ordinary $\frac{1}{12}$ or $\frac{1}{15}$ inch objective with moderate eye-piecing and tube length. The wide-spread publication of the description of this apparatus reminds us of the "lunar hoax" of a few years since, when it was claimed the inhabitants of the moon were plainly visible by means of a telescopic image magnified by means of a compound microscope. The case is exactly analogous.

* * *

The important function performed by the microscope in the development of the scientific study of medicine is forcibly stated by the eminent English physician Dr. Stephen MacKensie in his address to the British Medical Association in Montreal last August. It is reprinted in another column of the BULLETIN.

APERATURE AND ITS EFFECTIVENESS.

(Fifth Paper.)

BY HENRY ORFORD, PHILADELPHIA.

Sometime back I carried out an exhaustive series of experiments, with a diaphragm on lenses of all kinds and makes and a great deal of information resulted. Among older lenses (catalogued as of an aperture from 150° to 170° though in fact the usual aperture ranged from 75° to 85° only, the rest being uncorrected and would have added to their performance had it been cut away) I found in some cases the marginal rays were better corrected than the central ones, and it resulted in these lenses having better illumination on account of their having a larger corrected aperture. Now a lens corrected perfectly for the central rays, and for the marginal ones indifferently, would give less resolution and would also lack the illumination

FIG. 7.

of the lens with the marginal corrections. Coming to the modern lenses with their large aperture, perfectly corrected in almost every zone and working with a semi-apochromatic of 1.4 N. A. and putting a diaphragm behind the back lens with a portion cut away as in Fig. 7, thus using only a part of the extreme marginal rays, I found that the resolution was just as perfect as when using the whole of the uninterrupted aperture only with a great loss of illumination. When a diaphragm was placed behind the objective as in Fig. 8, the field gained 50 per cent. of illumination, though three parts of the total aperture was cut away. Unfortunately as we increase the corrections of large aperture

FIG. 8.

lenses the faults of workmanship observable increase enormously for each part of a degree gained, so that the skill of the workman must increase in proportion to the greater accuracy of the calculations. It will be seen that the stopping of separate parts of the aperture in no way effects the resolution of the image or its appearance as long as some part of its extreme aperture is open. When used with central light and a condenser having a fairly aplanatic cone, the resolution will only disappear when illumination fails and the image can be depended on as being legitimate, but with oblique illumination it is impossible to trust images seen, as being anything like a true resolution. When last I saw Mr. Lewis Wright, in London, he was about to carry out a series of experiments with diaphragms, in relation to aperture, and in his writings regarding microscopic images and resolutions, whilst thrashing out the truth between the diffraction image and the true one, after settling most ably (to my idea) the question for ever the true microscopic image, just as Dr. Abbe settled the making of high power objectives with small aperture for the medium magnification with large aperture; he says: "We must now turn to the other view of the great question. We have seen that when a pencil of light strikes on any minute regular periodic structure, such as a grating, it is diffracted into a central pencil, the diffraction bands forming angles with the central pencil, which can be calculated by Fraunhofer's law or drawn geometrically as follows. In Fig. 9, let WWW represent

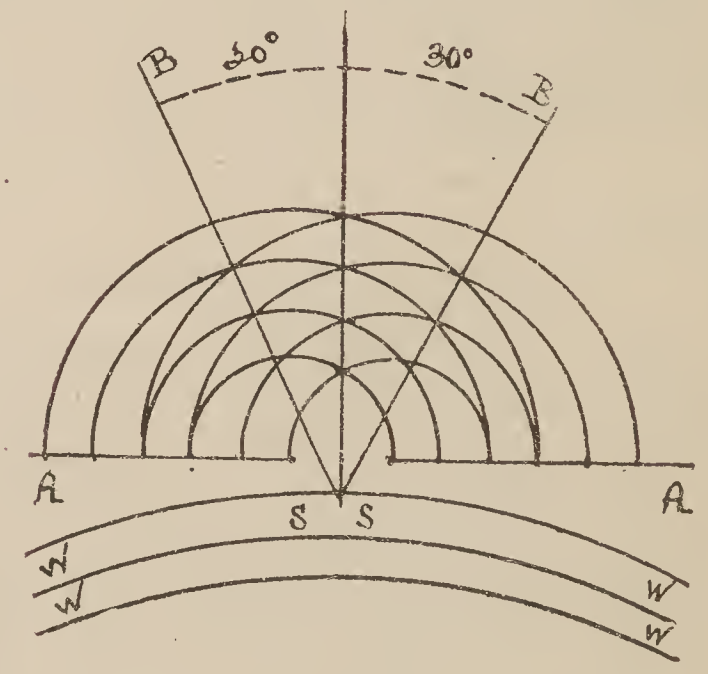

FIG. 9.

successive wave shells at the wave length distance proceeding from a very distant point to the direction of P,* and let us interrupt them by a screen or card AA, in which is a slit SS. The exact results depend upon the width of this slit. Here we will suppose that either the single slit or the width of a line and space of a grating equals two wave lengths. The "free" interferences from disturbances in the great wave front are now prevented, and each particle across the slit starts its disturb-

*The undulatory theory of a ray of light is taken for granted here, which is simply the line of propagation of a disturbance of wave motion in the invisible ether, just the same as is well represented by the smooth circular waves in a pond when a stone is dropped in.

ances afresh, unbalanced by the others. It can be shown that while every point of the slit can be accounted for (as shading off the bands), the most conspicuous phenomena are controlled by the disturbances from the points SS. We therefore strike arcs at wave-length distances from each of these points. Wherever these arcs cross, the motions arrive in the same phrase which in light means brightness. The principle line of these intersections is up the centre of the pencil through the slit to L, and there we get the maximum brightness; but it will be seen there are two other lines of intersections at angles of 30° on each side, the next intersections are at angles of 90°, or in the line of the screen AA. This is exactly borne out by experiment. Light of any wave-length sent through such a slit or grating, whose measure is two wave-lengths, produces two diffraction bands, one on each side of the central bright band at an angle of 30°. This is the basis of Fraunhofer's law of diffraction, that the angle of the inner bands is always such that its sine is equal to the wave-length divided by the width of the slit or grating. Here, then, we have to divide the wave-length by twice the wave-length, the result being 0.5, which is the sine of 30°; or construct a similar diagram for a slit four wave-lengths wide, when there will be three uniphrasal diffraction bands on each side of the central beam.

The finer the structure the wider the angle, until at one-wave fineness the angle of the inmost band becomes 90°. By causing the pencil to impinge upon the grating at a considerable angle, however, the central emerging pencil is similarly deflected. It hardly need be said that countless microscopic objects exhibit minute periodic alternations of structure, ridges, dots or apertures at regular distances of inconceivable minuteness. These structures must and do affect a pencil of light from a small source in the same way, as can be seen by focussing a P. angulatum, illuminated by a very small pencil, and then removing the eye-piece and looking down the tube at the back of the lens. The central pencil will be seen, and by monochromatic light the diffracted pencils will be seen around it. In white light, these diffracted pencils become spectra.

WIDAL'S REACTION WITH HOG CHOLERA ANTI-BACTERIAL SERUM HIGHLY DILUTED.

ROBT. L. PITFIELD, M. D., PHILA.

If an animal that has previously been inoculated with a sterile culture of the B. Typhosi, be bled and the serum collected, Widal's reaction may be obtained by adding this serum to a bacillum culture of the Bacillus Typhosi; at least six days must intervene before the serum will produce the reaction. This same thing is also true of other motile pathogenic bacteria, notably cholera and colon.

Dr. Dawson, of Washington, (N. Y. Med. Journal, Feb. 20, 1897) described the reaction obtained with the serum of a rabbit infested with hog cholera and suggested that the reaction as in typhoid be employed to aid in the diagnosis of hog cholera in swine; it being an extremely difficult matter to differentiate between hog cholera and swine plague, totally different, but allied diseases.

Accurate diagnosis in typhoid fever requires that the serum from a patient be diluted say 1-40 and then if the reaction appears within 30 minutes the case is one of typhoid fever.

In a horse rendered artificially immune to hog cholera infection by means of injections of sterile cultures of the bacillus of hog cholera, I was able seven days after the first injection of 10 c.c. of a sterile bacillus culture to secure a prompt reaction.

After eight injections, (half of them being over 200 cc. two being 350 cc.) of sterile cultures, blood from the jugular was drawn into a sterile vessel and various dilutions of the serum were used in order to determine to what degree of attenuation the serum was still capable of inducing the reaction. Control experiments showed that normal horse serum occasionally caused a prompt and complete reaction within a few minutes. Serum +10 parts of water gave a prompt and complete reaction. Serum +100 and serum +500 parts of water caused a complete reaction within 40 minutes.

Serum + 1000 parts of water also gave a complete reaction at the end of an hour.

Serum + 1000 parts of water also gave a complete reaction at the end of an hour.

Serum + 10,000 parts of water caused clumping of almost all the bacilli at the end of an hour and almost all had ceased active movements. Higher dilutions caused slight clumping with active movements of some bacilli. The cultures used both for immunizing the horse, and for the reactions was a virulent actively motile one. It had been passed through ten rabbits to raise its virulence. It was virulent to such a degree that .0001 cc. under the skin of a 500 gram guinea pig or 1000 gram rabbit killed invariably in seven days.

Pfeiffer's reaction was also beautifully demonstrated by injecting a guinea pig with 1 cc. of serum from the same horse and three days afterward a young active virulent culture was injected into the peritoneal cavity. By means of a capilary pipette, the contents of the peritoneal cavity were withdrawn ten minutes after injected and examined by means of a hanging drop. All the bacilli were paralyzed and in large clumps and after a stay of four hours in the incubator evidences of active protrolysis were manifest.

A NEW LABORATORY DISH.

BY PROFESSOR W. M. L. COPLIN, M. D.
PHILADELPHIA, PA.

In the laboratory of the college we use for routine work the paraffin method almost exclusively. The blocks of tissue are infiltrated in the usual manner, and the sections cut with the Ryder or Minot microtome. The student cuts his sections and fastens them on to the slides by means of Olemacher's combined water albumen method, a combination, with certain improvements, of the methods of Gaule and Mayer. These are then placed in the drying oven at a temperature of 37 C. for from 12 to 24 hours, until all the water is evaporated, the paraffin and section having, during the evaporation of the water, straightened out perfectly. The slide is now gently warmed until the paraffin, which has a melting point of 45 C., begins to melt, when it is thrust into kerosene, which in ten minutes completes the removal of the paraffin. The excess of the kerosene is wiped off, the slide washed with a few drops of alcohol and then placed in a dish of alcohol; from this dish of alcohol the stain is proceeded with as usual. If the tissue has been hardened in corrosive sublimate it is necessary to carry the cemented section through diluted tincture of iodine to remove the mercurial salt; this is followed by washing in alcohol when the section is ready for staining. The stains are conveniently kept in large salt-mouthed bottles into which the slides are placed for staining, mordanting, dehydrating and clearing. It is usual for the student to take from 5 to 10 slides through the various solutions, at one time, and, in so doing, he not uncommonly scratches the section off of one slide by rubbing it against another. This dfficulty arises, no matter whether the method of Gaule, Suchannek's modification of Gaule's method, Gulland's modification of Gaule's method, or, what is better, Heidenhain's water method, be used. Even in using any of the collodion methods does not permit us to escape this danger. In order to overcome this the writer sought very carefully through the dishes which have been designed by various workers, but failed to find anything which was ideally available. True, Ranvier has designed a rack upon a number of slides may be suported, but this is entirely too cumbersome for general laboratory use, and besides involves a large amount of fluid, which makes it an expensive luxury. With these points in view, I have devised a dish which is expected to overcome some of the above difficulties.

The inside measurements of the dish are 3½ inches in height, 1 inch square at the bottom, 1⅜ inches square—three inches from the bottom, and 1¾ inches in the diameter at the top, which is round and closed by means of ground, grooved Stender cover, which, of course, fits air-tight. In order to render the dish stable, the base is the broadest and eaviest part, measuring nearly 2½ inches in diameter. Extending upward from the bottom of the inside of the dish on two opposite sides, are eight ribs, four on each side, forming between them three grooves sufficiently wide to admit, in each groove, two slide of ordinary thickness. There can, also, be placed in the outside groove, between the outside ribs on each side and the inside of the dish two slides. This gives the dish, for ordinary purposes, convenient and not crowded, accommodation for eight slides standing on end; or, if the sections be not large and the slides not thick, four slides may be placed outside of the ribs, two on each side back to back.

An ordinary Stender dish requires about 120 cc. of fluid to immerse a slide sufficiently to cover a section cemented to its center. The above dish requires less than one-third of that amount to secure an equivalent degree of immersion. Of course, these dishes vary slightly in their capacity, as all pressed glassware does; such a variation, however, does not amount to more than from 10 to 15 cc.

Where, for reasons of economy, or otherwise, it may be desirable to close the top of the dish by means of a cork or rubber stopper, the expense may be materially reduced. When closed by means of a glass cover, as as described above, and shown in the illustration, the cover and the dish will each bear the same number out in glass, so that the student, working at his desk, may easily avoid mixing the covers which would not only be detrimental by mixing incombatable fluids; but, as each lid can be ground only to fit the dish which accompanies it, exchanged lids will not fit tightly.

In order to facilitate cleaning and to avoid inaccessible corners, all the corners are rounded.

The advantges claimed for the dish are: (1) Convenience, in that a number of slides can be safely handled at one time. (2) Great economy in the reagents; not only is the

FIG. 1. This cut is about two-thirds of the exact size of the dish. At A can be seen ten (10) slides, placed back to back and passing down between the ribs at B. Since this figure was drawn the width of the base has been increased, so that the base is now the width as shown in Fig. 2.

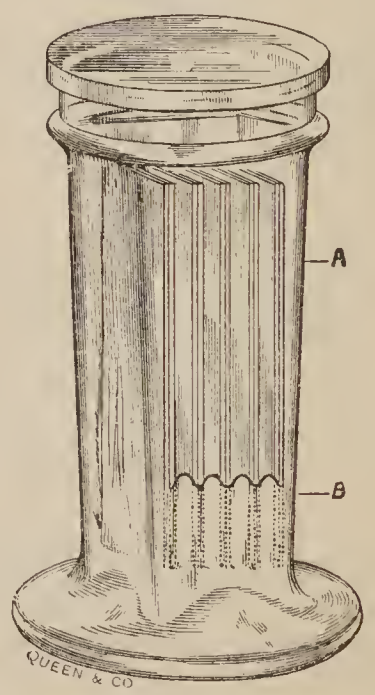

FIG. 1.

amount used less than is required by the use of Stender dishes, but in case, as will not uncommonly happen with students, anything occurs which ruins the contained fluid the loss may be materially less. (3) Solidity: no other dish of the same height and the same capacity possess the same solidity. (4) Contained fluids are prevented from evaporating by the tight-fitting top. This is not secured in the Naples dish.

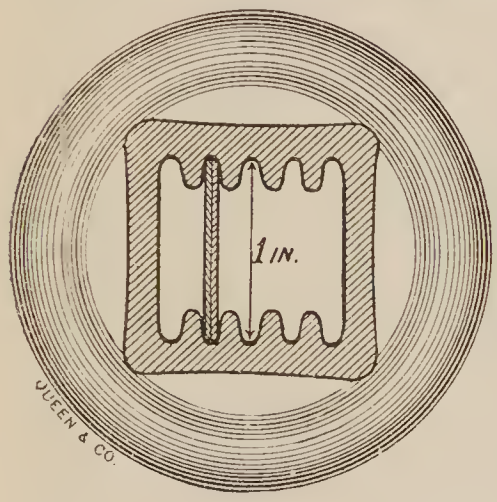

FIG. 2.

FIG. 2. This represents a transverse section of the dish at the point marked B. in Fig. 1. In this view we are looking down into the dish from above; the ribs and the intervening grooves are shown. The two arrows mark the position in which the ribs are lying and the two points, between which it is exactly one inch. Just to the left of the arrow is shown a transverse section of two slides placed back to back, as is usually done for staining.

I desire to express my appreciation of the help given me by Messrs. Queen & Co. in securing working drawings from which the above cuts have been made.—*Science.*

JEFFERSON MEDICAL COLLEGE.

A NEW FLAGELLA STAIN.

McCroni in the *British Medical Journal*, describes his method of staining flagella as follows:

Of different methods of staining flagella which have at different times been described, Van Ermeengen's, in my experience, gives excellent results, but takes too long to accomplish; while Loeffler's, as well as Nicolle and Morax's modification of the same, is very uncertain. Pitfield's method gives good results and is quickly accomplished, but the flagella are, as a rule, very faintly stained. The method which is now commonly adopted in this laboratory is somewhat similar to Pitfield's, but we use a different stain, and invariably we get both bacilli and flagella more distinctly stained than by Pitfield's method. The dye we use is an aniline blue, which is known commonly as "Night Blue," from the fact that it shows as well in artificial as it does in sun light. The formula which we find to give the best results is:

10 c.cm. of a concentrated alcoholic solution of "night blue."

10 c.cm. of a 10 per cent solution of alum.

10 c.cm. of a 10 per cent solution of tannic acid.

The addition of 0.1 to 0.2 g. of gallic acid would seem to add to the value of this mordant stain, but excellent results can be obtained without this addition.

The method we adopt is this: A drop of sterilized water is placed on an absolutely clean cover-glass, held in a Cornet's clip, and carefully inoculated with the smallest quantity of a twenty-four-hour's agar culture. The cover-glass is moved in such a way that the drop of water is distributed over nearly its whole surface, or a suspension may be made in a watch-glass and a thin film spread upon a cover-glass. It is then placed in the incubator until thoroughly dried (two minutes). A small quantity of the mordant stain is then poured on, and the cover-glass again placed in the incubator for two minutes, or held for that time two feet above the flame of a Bunsen burner. The excess of stain is now washed off by running water, the cover-glass dried in the incubator, and then mounted in Canada balsam. The mordant stain can be used either filtered or unfiltered: it does not necessarily require to be made fresh each time, as we find that the stain is quite as efficient after a fortnight or so as on the first day of use. The whole process can be accomplished in a few minutes.

ILLUMINATION OF OBJECTS.

BY ARTHUR M. EDWARDS, M. D.,
NEWARK, N. J.

On the 20th of October, 1856, being then the assistant in chemistry at the College of Physicians and Surgeons, New York, I ventured to pen my first microscopic article for publication. It was published in the *London Quarterly Journal of Microscopical Science.* I remember I was proud to have it published for I, a young student, had sent it to the great Dr. Lankester. But I was also proud to have it published for it contained a description of apparatus, a simple one, for illuminating objects under the microscope. That apparatus was the first that had been then published and was the germ that resulted in the illuminators of Dr. Royston Piggott and Prof. Abbe. I do not say that those were copied, for doubtless my article was never seen by either of those gentlemen, but the illumination was the same as theirs, and lately I have been experimenting with that illuminator of forty years ago and find it just as good as it was then.

But first let me describe it as it was and is now—a cheap illuminator which can take the place often of the expensive illuminators of modern microscopists. It consists of a plano-convex lens of a quarter or half an inch focus fixed by means of Canada balsam to a slip of glass. I now use a lens of an eighth of an inch focus, for I find that better than one of a quarter inch and fixed by means of gum thus instead of balsam. It is used alone or with a diaphragm, which can be made of card board, used between it and the mirror, or if the stage is movable it is fixed just beneath. When fixed on the stage the object, on a slide, is placed upon it, and I now use oil of cedar between the slide and

the glass of the illuminator. When this is used a clear white light is obtained on even a cloudy day. The light is also oblique and fine lined objects like the Bacillariaceæ are shown very distinctly.

Again I think after forty years this form of illuminator is applicable to all microscopes and to all objects and wish it would be tried. Besides it has the recommendation of being very cheap and can be home-made.

THE IMPORTANCE OF A GENERAL KNOWLEDGE OF BACTERIOLOGY.

The discovery of bacteria and their place in biology, the consequent complete revolution of many lines of thought, the abandonment of old theories and the establishment of new ones, have occurred so recently, and have followed each other with such rapidity, that much confusion exists in the public mind in regard to the subject. It is this confusion which prevents the accomplishment of the practical results which should ensue from this great acquisition to science. On the one hand there exists a morbid fear of the very name bacteria, on the other there is a skepticism quite as pernicious; and it may be said in passing that the unreliable statements of the newspapers are largely responsible for both beliefs. It is by means of our profession that confusion will be transformed into order. A clear knowledge of the life-history of these important organisms will go far to rid the public mind of an unnecessary anxiety, as well as to indicate where the real danger lies, and it is the duty of every physician to disseminate practical information in regard to microbiology whenever practicable.

It should be generally known that bacteria are minute organisms belonging to the lowest botanic orders; that each consists of a single cell, so small that it must be magnified 400 or 500 times in order to be observed; that these minute plants have the power of increasing in numbers very rapidly under favorable conditions by simply dividing into two, each half becoming a fully-developed organism like the original; that these plants are, like their larger relatives, some useful and some harmful; that many of these plants have the power of taking in food and converting it into a poisonous substance, just as the deadly nightshade, planted in the same soil and inhaling the same air as its cousin, the potato, will convert its food into poison, while the latter is a most useful food; that the poisonous substances formed by the bacteria, when absorbed by the human economy, produce diseases—modified, among other things, by the intensity of the poison, the rapidity of its absorption, and the location of its inception.

From a strictly utilitarian standpoint we may roughly classify bacteria as (1) useful, (2) harmless or neutral, and (3) harmful. Judging from the sensational articles appearing from time to time in the newspapers, one would suppose that every germ is a disease-producer, and that death to all microbes is a result devoutly to be desired; but, as a matter of fact, the vast majority of bacteria (both as to species and numbers) are either harmless or positively beneficial, the destruction of which would be in the nature of a calamity. Perhaps the greatest benefit which we derive from these little germs is their *role* in the oxidation of organic matter. All dead vegetable and animal matter is acted upon by them, and the complex chemic substances of organic life are reduced to simpler compounds, thus rendering innocuous what might be dangerous, or at least unpleasant, and at the same time furnishing those elements which enrich the soil and make possible the harvest. It has been said that without microbes crops would be impossible (Duclaux).

Microchemistry is a prime factor in the cleansing of water. By its action drinking-water which is contaminated with organic matter is rendered perfectly pure by the conversion of dangerous chemic compounds into harmless nitrites and nitrates; it causes the ripening of cheese; it produces the fine flavors of butter as well as some which are not so fine, and it is probable that at times bacteria are an aid in the digestion of food. At any rate, there are 331 described species of bacteria which are useful, or at least harmless, and only 158 species which are known to produce disease, and comparatively few of these affect the human family (Sternberg). And, moreover, since the conditions for existence of the disease-producing germs are not abundantly supplied, they have, on the whole, a rather hard life-struggle, and it is not wonderful that when the opportunity presents they improve it to the utmost.

It is the harmful germ with which we are most concerned. The useful germ we accept, like air and sunlight, as a matter of course. The harmful germs, after evading every effort to discover them for centuries, are rapidly being isolated, studied, and the influencets which are inimical to their continued exis - ence established. It was found that certain diseases, of which typhus is a type, depended for their propagation on the presence of filth. Measures were taken to remove the filth, and typhus disappeared. It is known that typhoid fever, malaria, cholera, and certain diarrheal affections are produced by the presence of germs in drinking-water, and that if such water is boiled these diseases will be prevented. It is known that the sputum of a tuberculous patient, when allowed to dry, may infect others, and that if the sputum is burned the major danger is avoided. It is known that air-borne diseases are, as a rule, carried but a short distance, and that if a patient suffering from them be isolated, and if all discharges and articles of clothing, etc., with which the patient has been in contact are disinfected, the danger of others contracting the disease is comparatively slight. It is

known that certain diseases are prevented or modified by vaccination or inoculation; that this acquired immunity is produced by a well-understood scientific principle, which is being repeatedly proven. It is known that for pus microbes, as well as others, there is nothing so conducive to their growth as heat and moisture, and that an old-fashioned poultice supplies these conditions most admirably, and that in the discarding of this dangerous agent for the treatment of open wounds, whether infected or not, and in purulent affections generally, much suffering and perhaps some lives have been saved.

These precepts are thoroughly practical, and even a superficial knowledge of the principles of bacteriology will convince the public of their importance, and the necessity of better measures of quarantine; of the enactment and enforcement of laws in regard to issolation and vaccination; of disinfection; of general sanitary cleanliness, including pure food, pure milk, pure water supply, and pure air; matters in which every individual is vitally interested. The more thoroughly bacteria and their effects are understood, the less we will hear of the scoffer, the anti-vaccination crank, and the mob which resists the health officer in the performance of his duty.

The public is beginning to see that the present practice of medicine is founded on science, and it is anxious to know more of it. It is remarkable what an interest people are taking in this scientific basis of medicine. Whether due to the training in science and physiology now common in our public schools or to some other reason would be difficult to decide, but certain it is that there is a wholesome desire for information which the physician should be the last to withhold. He may communicate the fact to his patients that it is unwise to poultice a boil; that it is necessary to disinfect polluted clothing and diarrheal discharges; that it is desirable to boil suspicious water, etc. Let him also explain to them why these things should be done, and in the majority of cases he will find his audience only too glad to listen, and prompt to obey.—*Medical News.*

ORCEIN STAINING.

Dr. Hermann Triepel describes in the *Zeitschrift für Wissenschaftliche Mikroskopie*, the following method of staining the elastin in small objects. The object which should not exceed 2 mm, in thickness is taken from 70 per cent. alcohol and immersed in this solution.

Orcein	0.5 grams.
Alcohol, 70 per cent. .	70 cc.
Hydrochloric Acid, (concent)	20 drops.

After twenty-four hours the tissue is removed and placed in hydrochloric acid and alcohol (alcohol 70 per cent., acid 1 per cent.) in which solution it remains until one is sure that the acid alcohol is thoroughly absorbed, This in any case is not over one-half hour and for very small objects is a shorter time. The object is then washed for at least two hours in absolute alcohol. This later serves to wash out the remaining acid and excess of stain and on this account should be changed at least once. Then follows xylol; paraffine and fixing in alcohol. The above mentioned orcein solution is concentrated. This fact is very important in successful staining. The formula may be easily attained by the modifications of that of Unna for section staining already published. The solution is tolerably permanent, as it may be kept for at least one year.

For section staining, Triepel uses the same solution which as has been before emphasized must always be concentrated. The staining in this case requires about six hours and it suffices to wash the section in alcohol.

The feasibility of the bulk staining, rests upon the fact that the elastin holds the orcein fast, which heretofore has been seldom experienced. One must therefore take care that the object remains not too long in the acid alcohol. This latter may be remedied by the timely washing in absolute alcohol. The result of the bulk staining has been highly satisfactory to Triepel, both for extended vessels (Gefässe) and for sections of eye lid.

A subsequent double staining of the section is of course possible.

THE MICROSCOPE IN MODERN MEDICINE.

Dr. Stephen Mackenzie, of London, said in the course of his presidential address to the Section of Medicine of the British Medical Association in Montreal last month:

"Of any one influence that has helped the advance of scientific study and the progress of medicine probably the increasing perfection of the microscope has been the greatest. With each new development of this instrument a greater range has been given to our researches, and, with the assistance of chemistry, it is continuing to reveal to us fresh facts that have created new branches of science. Starting from the observations of Bichat on the minute-anatomy of the tissues in 1801, the microscope has enabled us to understand the details of structure which were essential to complete anatomy. Until the microscope was capable of practical use the capillaries could not have been discovered by Malpighi, nor the composition of the blood understood; the mechanism of renal secretion could not be worked out until the minute structure of the kidney was known; the functions of glands, the process of digestion and secretion could not be understood until the histological details of the parts concerned were ascertained; the mechanism of light and hearing, of taste and smell, were not revealed until the ultimate details of the structures involved had been investigated;

the marvellous complexity of the nervous system, whether in the delicate though comparatively coarse structure of the nerves, the higher intricacy of the spinal cord, and the marvellous details of the arrangement of ganglionic cells and communicating fibres of the cerebral tissue, which by improved methods of preparation and staining are being revealed to us at the present time, could not have been worked out without its aid. Just as anatomy had to reach a certain stage before physiology and morbid anatomy became possible, so normal histology had to advance before pathological histology could come into existence. And, as knowledge advances from the special to the general, special pathological histology had to reach to a very high point before we could reach that knowledge of general pathology on which our conceptions of the nature of disease are at present based.

What would Harvey have given to see the capillaries that completed the "circle" of the blood stream, or to have watched the process of inflammation in the exposed mesentery of the frog by the aid of the microscope—to see the contraction followed by dilatation of the blood vessels, the escape of blood corpuscles through the walls of the vessels? What a vastly different conception has the reader of Cohnheim's Lectures on General Pathology to that of the most advanced and profound investigator and physician of two and a half centuries ago. The microscope again has introduced us to a new world, revealing minute organisms that play a great part in the plan of nature and which are largely concerned in the production of disease. It has led to a new department of science, bacteriology, which has taught us how bacteria enter the body, how they increase and multiply therein, and of the reaction of the tissue for self protection. Chemistry has shown how the poisons formed by such organisms act in the body and supplied us with means, as yet only in their infancy, for counteracting their effects, or guarding against their entrance by their exclusion and by protective inoculation. The microscope has further furnished us with evidence of parasitism, other than bacteria, in the blood, in the muscles, in the skin and hair, and on the mucous membranes. By its aid we are able to diagnose and watch the course of several primary diseases of the blood. It has enabled us to differentiate the various new growths that develop in our bodies. So much does the microscope constitute a necessary means of research that it would be impossible to conscientiously perform our daily medical duties without its aid."

ON A BACILLARIAN DEPOSIT FROM JAPAN.

BY ARTHUR M. EDWARDS, M. D., NEWARK, N. J.

I have this Spring received a specimen of deposit of Bacillariaceæ from Japan and as it is of interest I will detail what it is. The specimen was from Professor Matajiro Yokoyama, professor of Palœontology in the Science College of the Imperial University of Japan at Tokyo. It is labelled "Tuff nodule from the Tertiary Formation of Nogami, District of Kusu, Province of Bungs, Island of Kinshin," Japan. Professor Yokoyama sent me a prepared slide also which shows the characters very nicely. The specimen is half of a nodule about two and a quarter inches in diameter, round and hard, made up apparently of a fine grained sandstone of a light brown color. The nodules is darker brown to one-sixteenth of an inch on the surface which is followed by a line of lighter color, showing the organic matter, for it is that no doubt, modified somewhat. It is almost white on the surface. As to the geology of the specimen Professor Yokoyama writes me that he "can only say that it is *probably Tertiary* as the rock itself and the plants and fishes which are occasionally found in it look similar to those of the pliocene and miocene of other parts of Japan." I should class it as of the glacial period from the microscopical examination. At all events it is of interest to enumerate the Bacillariacæ found in it for it is the first of the Glacial period, if it prove to be that, that I have seen from Japan.

On boiling the stone, for it is a stone quite hard, in soda carbonate, washing soda of the shops, and cleaning the residue with bichromate of potassium and sulphuric and hydrochloric acid, and washing in pure water, we have the following Bacillariaceæ.

It is by far made up from the tonics of *Stephanodiscus berolivensis*, C. G. E. This was described by Ehrenberg in the *Bericht* of the Berlin Academy, in 1845. There are twenty-one forms or species of *Stephanodiscus*, most of them named and described by Ehrenberg. But they all can be ranked as one from *S. bevelinensis*, which is the first. They all are forms of *Cycloterra* which grew in loose chains in pure water. Some of them by traveling down came into brackish water and so to the sea, but one form is prevalent, *S. berolivensis* is alive at Berlin and found in Ægypt, and therefore called *S. Ægyptiacus* by Ehrenberg, and in the Niagara river in this country called *S. niagaræ*. They are extremely beautiful discs, rather large, and covered with fine hexagonal reticulation radiating from the centre and marked by rays which also radiate from the centre and which have spines sticking up at angle of 45° to plain of the value. Although the spines can be seen in *S. berolivensis* the rays and marking is not as well seen as in *S. niagaræ*. The rays seem to be in the middle of valve, not being near the centre or the periphery. There are also in this Japan specimen *Stephanodiscus* of two sizes, but they evidently are the same form of species.

There is also present, scarcely, *Epithemia jurgensu*, C. A. A. and *E. gibba*, C. G. E. and *Fragilaria pectinale*, O. F. M. and perhaps some other forms. But *Stephanodiscus berolivensis* is the commonest and can be said to make up by far the mass of the specimen.

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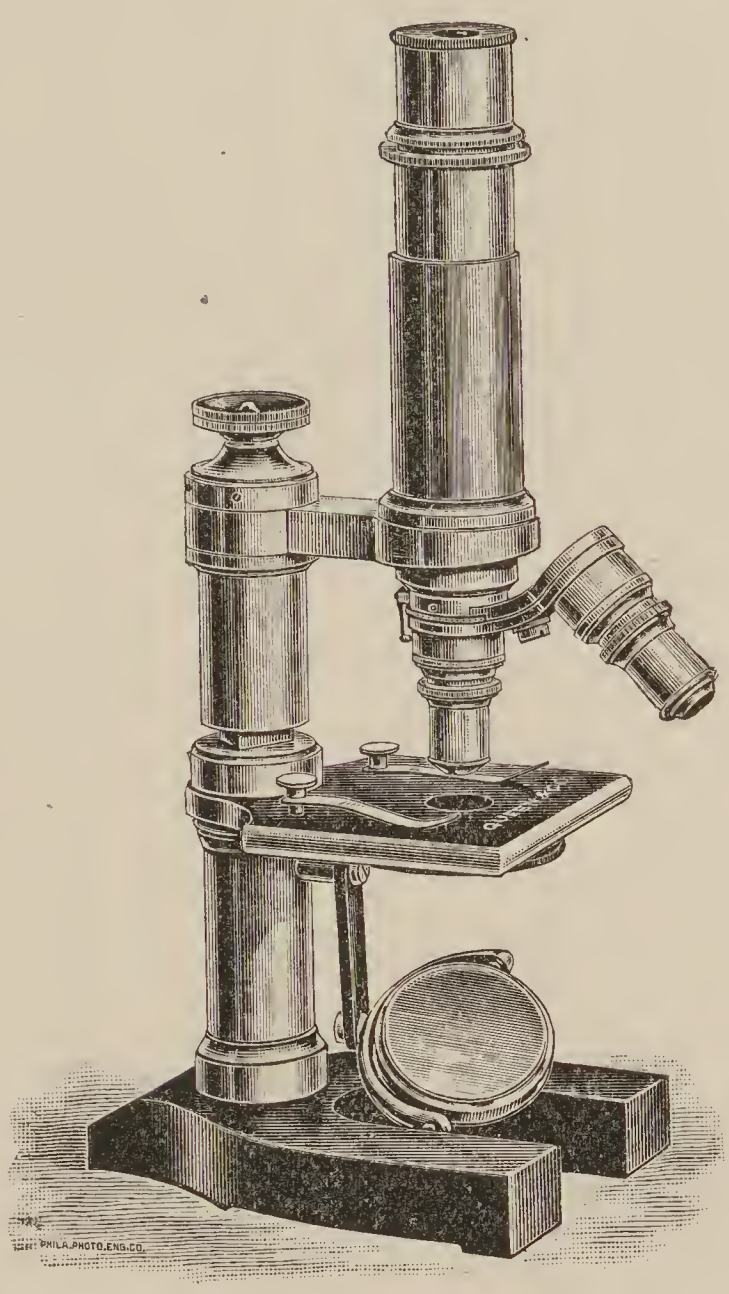

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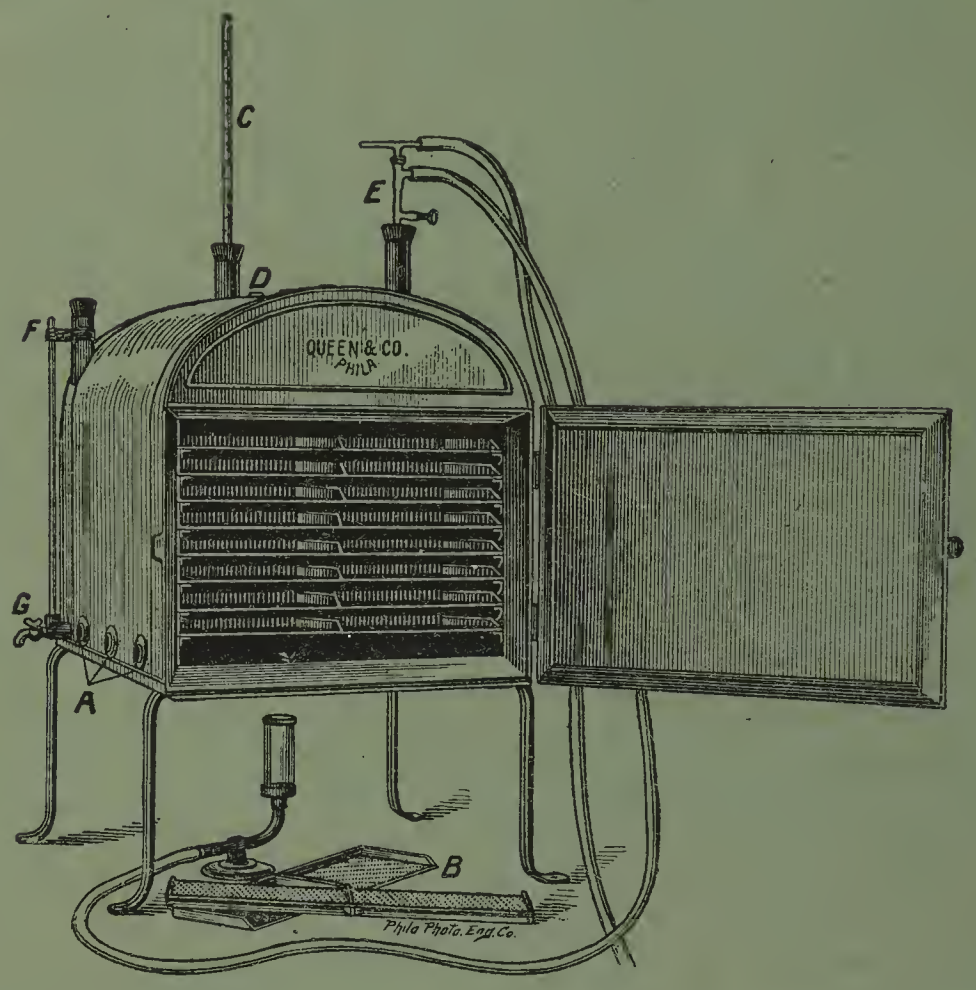

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